SPECIFICATION

RESIN COMPOSITION FOR PURGING CONTAMINANT IN THE PLASTIC PROCESSING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a resin composition for purging contaminant in the plastic processing machine.

2. Description of the Related Art

Plastics have excellent properties such as easy processability, high productivity, light weight and relative low procuring cost, so they are used for the parts and structural materials for automobile, autobicycle, scooter, television, radio, audio equipment, washing machine, rice cooker, personal computer, portable telephone, game machinery, building materials, office supplies, stationery, toys, sports goods, sports equipment, agricultural tools and marine tools.

They are usually prepared by plastic processing methods such as injection molding, blow molding, compression molding, transfer molding, rotating molding, slush molding, inflation tubular film process, and extrusion molding.

As plastics processing are conducted at high temperature above 200℃, additives, monomers, decomposed materials in the plastics are changed to carbonized materials such as tar, pitch and other colo-

ured sticky substances, which are apt to adhere to the surface of the screw, barrel and die of the plastic processing machine to cause transfer of the carbonized materials to the molded product.

Above mentioned transfer make the surface of molded product dirty and make the dimensions of the molded product unaccurate, resulting not to perform expected moving or structual function, therefore cleaning the screw, barrel and die of the plastic processing machine has been required.

In case of production change from specific coloured molded article to noncoloured or other coloured molded article, cleaning the screw, barrel and die has been also required to avoid crossconta-mination caused by remained specifically coloured resin compound.

However there are some problems on the conventional cleaning method of the screw, barrel and die.

One conventional cleaning method has been known as the method of dismantling the plastic processing machine, resulting to expose the screw, barrel and die to outside, then the carbonized material or coloured materials adhered to the surface of the screw, barrel and die are removed by using the separating tools such as knife.

However, this method has a defect of exposing operater to high temperature and taking long times, which causes some time operater's suffering of skin burn

or electric shock.

In case of a large size plastic processing machine, dismantling is impossible.

There is known other conventional cleaning method in which uncoloured thermoplastic resin such as low density polyethylene is passed through inside of the plastic processing machine.

However this method can not remove contaminants entirely even if a lot of time has been spent and this method generates a large amount of mixed product consisting of contaminants and resin, which scagely find use as the recycling resin compound.

The other cleaning method is the method of using the resin composition containing of inorganic powder such as calcium carbonate which exerts improved effect of removing coloured contaminants.

However, it causes new problem of remaining the inorganic power in the plastic processing machine.

Another cleaning method also has been attempted by using resin composition consisting a thermoplastic resin such as low density polyethylene and a surface active agent such as sodium stearate or polyoxyethylene nonylphenyl ether having the effect of lowering interface tention, but the coloured contaminants was scarecely removed.

Based on the above mentioned knowledge, new cleaning method has been disclosed in the Japanese Kokai Patent (H2-180941 and H7-53774), in which it is disclossed

a resin composition consisting of uncoloured th moplastic resin and calcium salt of organic boron compound having a SP3 hybridization orbitals, resin composition which maintains a certain extent of abrasive property.

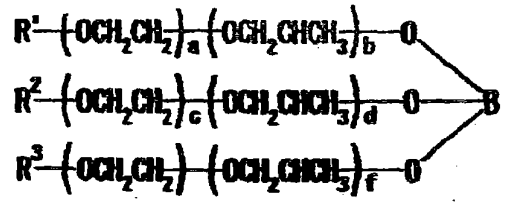
However, the method is still not excerts sufficient effect of removing the coloured contaminant.

SUMMARY OF THE INVENTION

As a result of diligent ivestigation by the present invention under such situation, the present invention provides a resin composition for purging away contaminant in the plastic processing machine comprizing a thermoplastic resin and a specific borate ester of polyoxyalkylene , and a purging method of contaminant in the plastic processing machine by passing said resin composition through inside of the plastic processing machine.

DETAILED DESCRIPTION OF THE INVENTION

A borate ester of polyoxyalkylene used for the present invention is a chemical compound expressed by the following general formula (1).

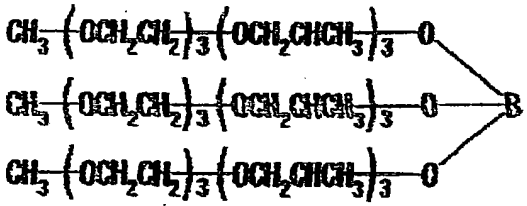


(1)

wherein R^1, R^2 and R^3 are independently selected from group consisting of hydrogen and hydrocarbon group, a, b, c, d, e and f are positive integers independently from 0 to 30 whose sum is from 6 to 80.

Example of the hydrocarbon group are alkyl group such as methyl, ethyl, propyl, isopropyl, buthyl, penthyl, hexyl, octhyl, nonyl, decyl, dodecyl, hexadecyl, octadecyl and docosyl groups and phenyl, tolyl and cyclohexyl group.

Illustrative of the borate eater of polyoxyalkylene are the chemical compound expressed by the following chemical formula from (2) to (27).



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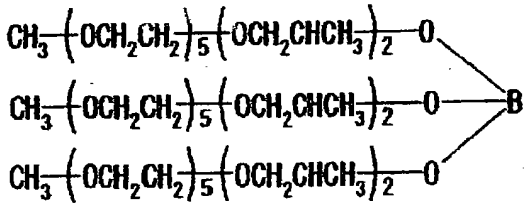

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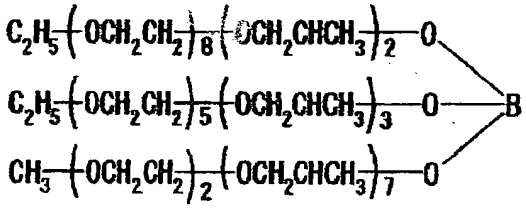

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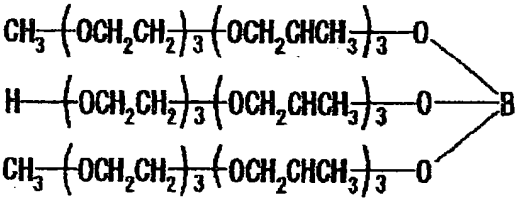

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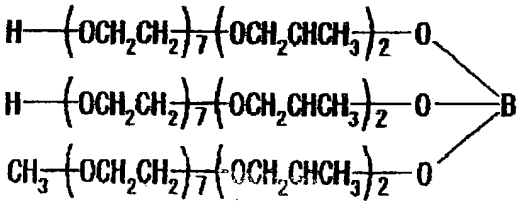

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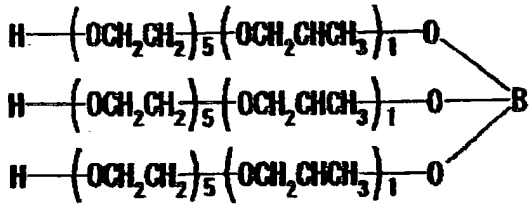

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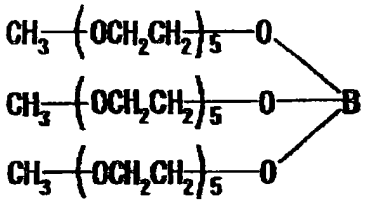

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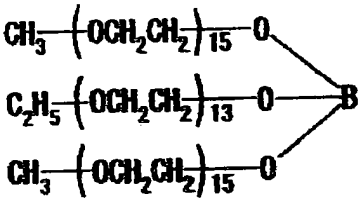

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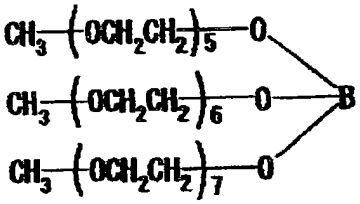

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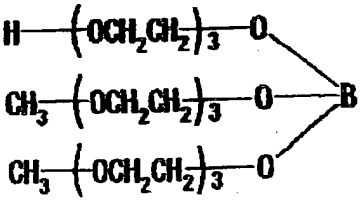

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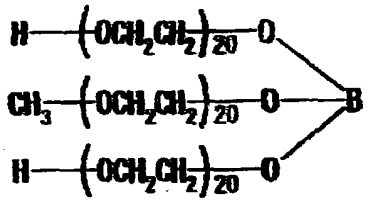

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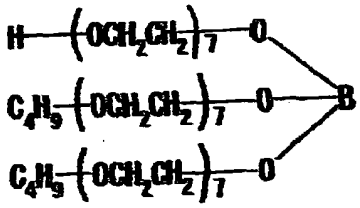

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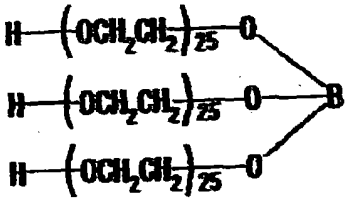

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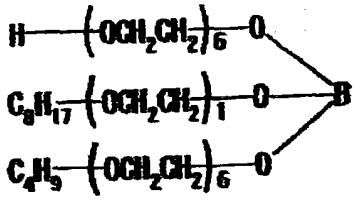

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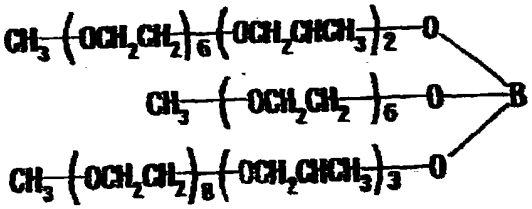

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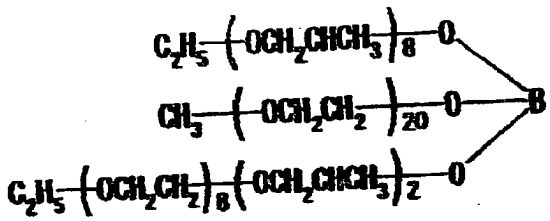

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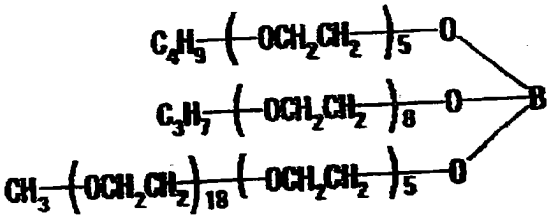

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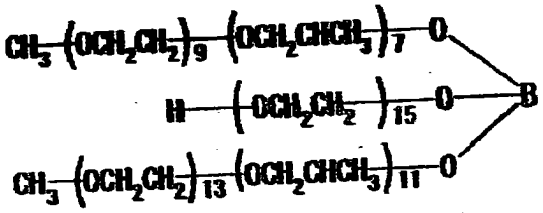

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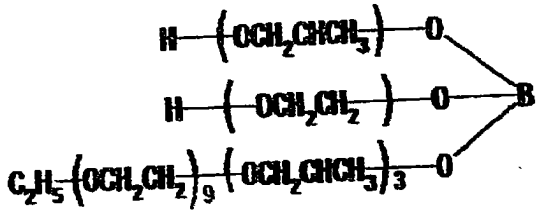

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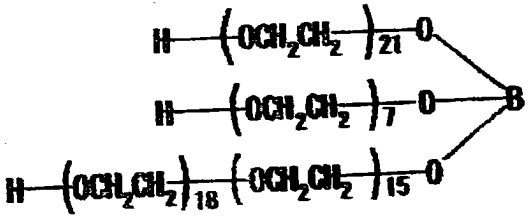

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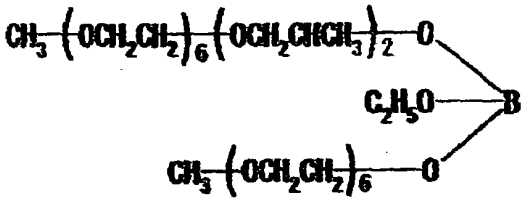

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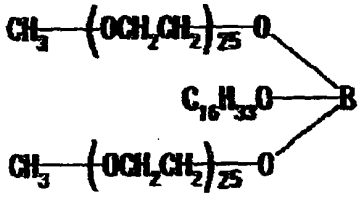

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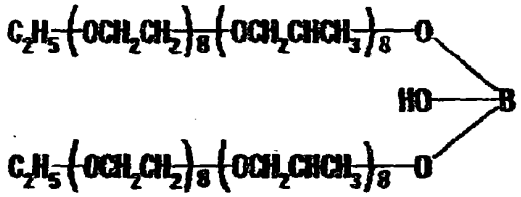

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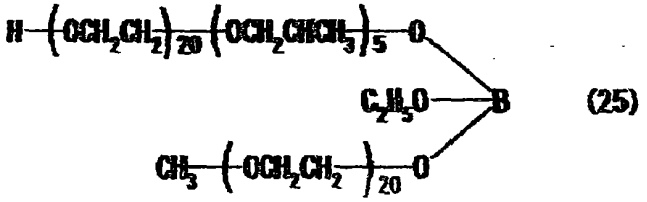

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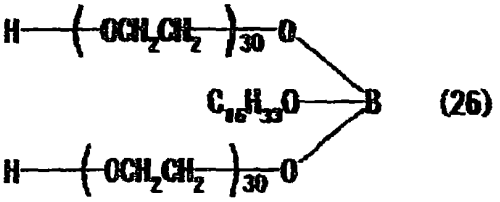

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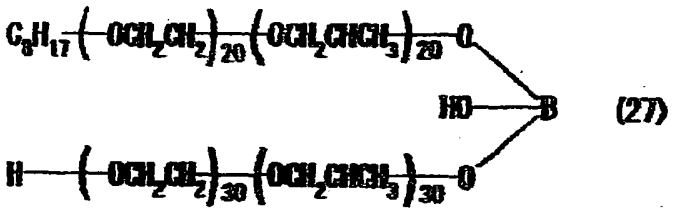

(27)

Production method for borate esters of polyoxyalkylene used for thr present invention are not limited to specific method, but following method is preferable.

The borate esters of polyoxyalkylene are produced by esteryfication-dehydration or ester-exchange reaction by contacting polyoxyalkylene expressed by the chemical formula (28) with boric acid or borate esters of lower alcohol such as methyl alcohol or ethyl alcohol.

It is prefavable that reaction is carried out by using 1 mol of boric acid or borate esters of lower alcohol with from 3 to 3.5 moles of polyoxyalkylene expressed by the chemical fomula (28).

If the mole ratio is less than 3, it is not prefevable because undesirable byproducts of borate esters having two or three boron atoms are generated.

The other byproducts or unreacted polyoxalkylene may be remained in the borate esters unless they do not hinder the purging effect of the resin composition of the present invention.

$$R^1(OCH_2CH_2)a(OCH_2CHCH_3)bOR^2 \qquad (28)$$

wherein R^1 and R^2 are independently selected from group consisting of hydrogen and hydrocarbon group, a and b are independently from 0 to 30.

Example of the hydrocarbon group are alkyl group such as methyl, ethyl, propyl, isopropyl, buthyl, pentyl, hexyl, octyl, nonyl, decyl, dodecyl, hexadecyl, octadecyl and docosyl groups and phenyl, tolyl and cyclohexyl group.

Example of the polyoxyalkylene expressed by the chemical formula (28) are as follows.

diethylene glycol monomethyl ether,
diethylene glycol monoethyl ether,
diethylene glycol monoisopropyl ether,
diethylene glycol monobuthyl ether,
diethylene glycol monooctyl ether,
diethylene glycol monodecyl ether,
diethylene glycol monohexadecyl ether,
diethylene glycol monooctadecyl ether,

triethylene glycol monomethyl ether,
triethylene glycol monoethyl ether,
triethylene glycol monoisopropyl ether,
triethylene glycol monobuthyl ether,
triethylene glycol monobuthyl ether,
triethylene glycol monooctyl ether,
triethylene glycol monodecyl ether,
triethylene glycol monohexadecyl ether,
triethylene glycol monooctadecyl ether,

tetraethylene glycol monomethyl ether,
tetraethylene glycol monoethyl ether,
tetraethylene glycol monoisopropyl ether,
tetraethylene glycol monobuthyl ether,

tetraethylene glycol monooctyl ether,
tetraethylene glycol monodecyl ether,
tetraethylene glycol monohexadecyl ether,
tetraethylene glycol monooctadecyl ether,

polyethylene glycol monomethyl ether,
polyethylene glycol monoethyl ether,
polyethylene glycol monoisopropyl ether,
polyethylene glycol monobuthyl ether,
polyethylene glycol monooctyl ether,
polyethylene glycol monodecyl ether,
polyethylene glycol monohexadecyl ether,
polyethylene glycol monooctadecyl ether,

dipropylene glycol monomethyl ether,
dipropylene glycol monoethyl ether,
dipropylene glycol monoisopropyl ether,
dipropylene glycol monobuthyl ether,
dipropylene glycol monooctyl ether,
dipropylene glycol monodecyl ether,
dipropylene glycol monohexadecyl ether,
dipropylene glycol monooctadecyl ether,

tripropylene glycol monomethyl ether,
tripropylene glycol monoethyl ether,
tripropylene glycol monoisopropyl ether,
tripropylene glycol monobuthyl ether,
tripropylene glycol monooctyl ether,
tripropylene glycol monodecyl ether,
tripropylene glycol monohexadecyl ether,
tripropylene glycol monooctadecyl ether,

tetrapropylene glycol monomethyl ether,
tetrapropylene glycol monoethyl ether,
tetrapropylene glycol monoisopropyl
ether,

tetrapropylene glycol monobuthyl ether,
tetrapropylene glycol monooctyl ether,
tetrapropylene glycol monodecyl ether,
tetrapropylene glycol monohexadecyl ether,
tetrapropylene glycol monooctadecyl ether,

polypropylene glycol monomethyl ether,
polypropylene glycol monoethyl ether,
polypropylene glycol monoisopropyl ether,
polypropylene glycol monobuthyl ether,
polypropylene glycol monooctyl ether,
polypropylene glycol monodecyl ether,
polypropylene glycol monohexadecyl ether,
polypropylene glycol monooctadecyl ether,

diethyleneglycol tripropyleneglycol monomethyl ether,
tetraethyleneglycol dipropyleneglycol monomethyl mether,
tetraethyleneglycol tripropyleneglycol monomethyl ether,
tetraethyleneglycol tetrapropyleneglycol monomethyl ether,
pentaethyleneglycol dipropyleneglycol monomethyl ether,
pentaethyleneglycol tripropyleneglycol monomethyl ether,
diethyleneglycol tetrapropyleneglycol monomethyl ether,

hexaethyleneglycol dipropyleneglycol monomethyl ether,
hexaethyleneglycol dipropyleneglycol monomethyl mether,

hexaethyleneglycol tripropyleneglycol monomethyl ether,
hexaethyleneglycol tetrapropyleneglycol monomethyl ether,
hexaethyleneglycol pentapropyleneglycol monomethyl ether,
hexaethyleneglycol hexapropyleneglycol monomethyl ether,

heptaethyleneglycol dipropyleneglycol monomethyl ether,
heptaethyleneglycol dipropyleneglycol monomethyl mether,
heptaethyleneglycol tripropyleneglycol monomethyl ether,
heptaethyleneglycol tetrapropyleneglycol monomethyl ether,
heptaethyleneglycol pentapropyleneglycol monomethyl ether,
heptaaethyleneglycol hexapropyleneglycol monomethyl ether,
heptaaethyleneglycol heptapropyleneglycol monomethyl ether,

octaethyleneglycol dipropyleneglycol monomethyl ether,
octaethyleneglycol tripropyleneglycol monomethyl mether,
octaethyleneglycol tetrapropyleneglycol monomethyl ether,
octaethyleneglycol pentapropyleneglycol monomethyl ether,
octaethyleneglycol hexapropyleneglycol monomethyl ether,
octaethyleneglycol heptapropyleneglycol monomethyl ether,

polyethyleneglycol polypropyleneglycol monomethyl ether,

triethylene glycol ,
tetraethylene glycol ,
pentaethylene glycol ,
hexaethylene glycol ,
heptaethylene glycol ,
octaethylene glycol ,
decaethylene glycol ,
tridecaethylene glycol ,
hexadecaethylene glycol ,
eicosaethylene glycol ,
pentacosaethylene glycol ,
triacosaethylene glycol ,

tripropylene glycol ,
tetrapropylene glycol ,
pentapropylene glycol ,
hexapropylene glycol ,
heptapropylene glycol ,
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triethylene glycol tripropylene glycol,
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octaethylene glycol tripropylene glycol,
octaethylene glycol tetrapropylene glycol,
octaethylene glycol pentapropylene glycol,
octaethylene glycol hexapropylene glycol,
octaethylene glycol pentapropylene glycol,
octaethylene glycol octapropylene glycol,
polyethylene glycol polypropylene glycol,

tripropylene glycol triethylene glycol monomethyl ether,
tetrapropylene glycol diethylene glycol monomethyl ether,
tetrapropylene glycol triethylene glycol

monomethyl ether,
tetrapropylene glycol tetraethylene glycol monomethyl ether,
pentapropylene glycol diethylene glycol monomethyl ether,
pentapropylene glycol triethylene glycol monomethyl ether,
pentapropylene glycol tetraethylene glycol monomethyl ether,

hexapropylene glycol diethylene glycol monomethyl ether,
hexapropylene glycol triethylene glycol monomethyl ether,
hexapropylene glycol tetraethylene glycol monomethyl ether,
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hexapropylene glycol hexaethylene glycol monomethyl ether,

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heptapropylene glycol tetraethylene glycol monomethyl ether,
heptapropylene glycol pentaethylene glycol monomethyl ether,
heptapropylene glycol hexaethylene glycol monomethyl ether,
heptapropylene glycol heptaethylene glycol monomethyl ether

octapropylene glycol diethylene glycol monomethyl ether,

octapropylene glycol triethylene glycol monomethyl ether,
octapropylene glycol tetraethylene glycol monomethyl ether,
octapropylene glycol pentaethylene glycol monomethyl ether,
octapropylene glycol hexaethylene glycol monomethyl ether,
octapropylene glycol heptaethylene glycol monomethyl ether
octapropylene glycol octaethylene glycol monomethyl ether
polypropylene glycol polyethylene glycol monomethyl ether

tripropylene glycol triethylene glycol monomethyl ether,
tetrapropylene glycol triethylene glycol monomethyl ether,
tripropylene glycol triethylene glycol monomethyl ether,
octapropylene glycol diethylene glycol monomethyl ether,

octaethylene glycol dipropylene glycol monomethyl ether,
octaethylene glycol tripropylene glycol monomethyl ether,
octaethylene glycol tetrapropylene glycol monomethyl ether,
octaethylene glycol pentapropylene glycol monomethyl ether,
octaethylene glycol hexapropylene glycol monomethyl ether,
octaethylene glycol heptapropylene glycol monomethyl ether,

octaethylene glycol octapropylene glycol monomethyl ether,
polyethylene glycol polypropylene glycol monomethyl ether.

A solvent or diluent may be incorporated into the raw materials such as boric acid, borate rster of lower alcohol and polyoxyalkylene, or into borate esters of glycol ether.

If the solvent or diluent are employed, they must not disturb the esteryfication-dehydration or ester-exchange reaction and their boiling point are preferable bellow the boiling point of the byproducts or polyoxyalkylenes.

Example of the solvent or diluent are ethers such as diethyl ether, dioxane, tetrahydrofran; aliphatic hydrocarbons such as hexane, acetic anhydride, heptane, octane, nonane, decane, undecane; aromatic hydrocarbons such as benzene, toluene, xylene; cycloalkane such as cyclohexane, cyclohexene; non-proton polar compound such as dimethy formamide, dimethyl sulfoxide, hexamethyl polyamide phosphate, acetonitrile, N-methyl pyrrolidone; and their chlorine substituted compound such as chloroform and carbon tetrachloride.

A catalysts for the esteryfication-dehydration or ester-exchange reaction may be used.

If the catalysts are necessary for promoting the reaction, following condensation catalysts are recommended.

Example of the catalysts are metallic

salt of organic acid such as ferrous octanoate, ferrous naphthenate, cobaltous naphthenate, manganese octanoate, stannum octanoate, stannum naphthenate, lead octanoate, lead naphthenate, organotin compound such as dibuthy tin diacetate, dibuthyl tin dioctanoate, dibutyl tin dilaurate, dibutyl tin dioleate, dibutyl tin dimethoxide, oxidized dibutyl tin; metal alcoholate such as tetrabuthyl titanate, tetrabutyl zirconate; titanium chelate such as di-isopropoxy bis-acetyl acetonate titanium, 1, 3-propanedioxy bis-ethylacetonate titanium, 1, 3-propanedioxy bis-ethylacetoacenate titanium; alminum chelate such as alminum acethyl-acetonate, alminum tris-ethylacetoacetonate; amines such as hexyl amine, dodecylamine phosphate, dimethyl hydroxyamine, diethyl hydroxyamine; tetra-ammonium salt such as benzyl hydroxyamine; inorganic acid such as hydrochlonic acid, nitric acid, sulfric acid, phosphoric acid; organic acid such as acetic anhydride, pure acetic acid (over 99.8%), propionic acid, citric acid, benzoic acid, formic acid, acetic acid, oxalic acid, p-toluenesulfonic acid; chlorosilane such as methyl tri-chlorosilane, dimethyl di-chlorosilane; inorganic base such as aqueous ammonia; organic base such as ethylene diamine, tri-ethanol amine; and amino alkylamine.

It is preferable that the esteryfication-dehydration or ester-exchange reaction is carried out under the condition

of at reduced or atmospheric pressure, from 50 to 250℃ temperature, favourably from 100 to 180℃.

Under the reaction, removal of byproducts such as lower alcohol or water can proceed the reaction easily because removal of byproducts proceed the reaction equilibrium to favorable direction of borate ester of polyoxyalkylenes formation.

As to the removal method, azeotropic distillation using azeotropic agent and batch or continuous distillation using distillation tower are preferable.

For the purpose of improving the properties of the borate ester of polyoxyalkylenes, amino group containing compound and/or solvent may be added to said borate esters of polyoxyalkylenes.

Adding the amino group containing compound to the borate ester of polyoxyalkylenes exhibits the suppressing of borate ester hydrolysis and also exhibits rust preventive effect under the condition of existense of water or its vapor.

Examples of the amino-group containing compound include alkylamine, cyclo alkyl amine, alkanol amine, heterocyclic amine, diamine, lactam, cyclic imide and polyamine, which may be used alone or combination selecting from these compound.

As the alkyl amine, there can be used methyl amine, dimethyl amine, trimethyl amine, ethyl amine, diethyl amine, triethyl amine, propyl amine, N, N-di[poly(4) oxyethyl] hexadecyl amine, dodecyl dime-

thyl amine, stearamide propyl dimethyl amine, polyoxyethylene (3-30) octadecyl amine, polyoxyethylene (3-30) laurylamine, polyoxyethylene (3-30) oleyl amine, polyoxyethylene (3-30) dilauryl amine, polyoxyethylene (3-30) stearyl amine , polyoxyethylene (3-30) alkylamine, polyoxyethylene (3-30) dialkyl amine, and di (oleoyloxyethyl) hydroxy amine.

As the cycloalkyl amine, there can be used cyclohexyl amine, methyl cyclohexyl amine and ethyl cyclohexyl amine.

As the alkanol amine, there can be use d ethanol amine, diethyl hydroxy methyl amine, diethanol amine, dimethyl amino-ethanol, triethanol amine, propanolamine, dimethy 2-hydroxypropyl amine, buthanol amine, methyldi (2-hydroxyethyl) amine, tri (2-hydroxyethyl) amine, hydroxymethyl di (2-hydroxyethyl) amine, dibenzil 2-hydroxypropyl amine and cyclohexyl di (2-hydroxyethyl) amine.

As the cycloalkanol amine, there can be used cyclohexanol amine, methylcyclohexanol amine and ethylcyclohexanol amine.

As the heterocyclic amine, there can be used used pyridine, lutidine, 3, 4-xylidine, piperidine, N-methyl piperidine and N-ethyl piperidine.

As the lactam, there can be used propio lactam, N-methylpropio lactam, N-ethyl buthyro lactam, N-methyl varero lactam, N-methyl caprolactam and phenyl caprolactam.

As the cyclic imide, there can be used

succinimide, N-methyl succinimide, N-ethyl succinimide, phenyl succinimide and 2-undecyl imidazoline.

As the diamine, there can be used ethylene diamine, triethylene diamine and tetraethylene diamine.

As the polyamine, there can be used diethylene triamine, triethylene tetramine and pentaethylene pentamine.

Among these aminogroup containing compound, tertiary aminogroup containing compounds exhibit excellent effect of preventing hydrolysis of borate ester of polyoxyalkylene and promoting the cleaning and purging the coloured contaminants.

Example of tertiary aminogroup containing compounds having above mentioned excellent properties are polyoxyethylene (3-30) octadecyl amine, polyoxyethylene (3-30) laurylamine, polyoxyethylene (3-30) oleyl amine, polyoxyethylene (3-30) dilauryl amine, polyoxyethylene (3-30) stearyl amine , polyoxyethylene (3-30) alkylamine, polyoxyethylene (3-30) dialkyl amine and di (oleoyloxyethyl) hydroxy amine.

The amount of aminogroup containing compound to 100 parts by weight of borate ester of polyoxyalkylene is from 0 to 100 parts by weight, favourably from 5 to 50 parts by weight and most fovourably from 10 to 30 parts by weight.

Use of the solvent contributes to lower viscosity of the borate ester of polyoxyalkylene .

As the solvent, there can be used

water, methyl alcohol, ethyl alcohol, isopropyl alcohol, butyl alcohol, isopropyl ether, ether, ethylene glycol, polyethylene glycol, polyethylene dimethyl ester, diethylene glycol, triethylene glycol, ethylene glycol dimethyl ether, diethylene glycol dimethy ether, diethylene glycol diethy ether, ethylene glycol dipropyl ether, triethylene glycol dimethyl ether, triethylene glycol monobuthyl ether, diethylene glycol monobutyl ether, diethylene glycol diethyl ether, diethylene glycol propyl ether, diethylene glycol dibuthyl ether, dimethyl ether, propylene glycol, acetone, methyethyl ketone, furfural, dioxane, methane sulfonate, diethy ether, tetra hydrofuran, hexane, acetic anhydride, heptane, octane, nonane, decane, undecane, benzene, toluene, xylene, cyclohexane, cyclohexene, dimethyl formamide, dimethy sulfoxide, hexamethyl triamide phosphate, acetonitrile, N-methyl pyrrolidone, chloroform and carbon tetrachloride and the solvents are used by alone or combination.

The amount of solvent to 100 parts by total weight of borate ester of polyoxyalkylene and aminogroup containing compound are from 0 to 100 parts by weight, favourably from 5 to 50 parts by weight and most favourably from 10 to 30 parts by weight.

The other ingredient other than aminogroup containing compound and/or solvent may be incorporated to borate ester of

polyoxyalkylene for the purpose of improving the properties of cleaning and purging resin compound of the present invention.

As the other ingredient, there can be used stabilizer, neutralizer, antioxidant, ultraviolet absorber, light stabilizer, antistatic agent, lubricant, processability improving agent, filler, dispersing agent, coupling agent, anticopper rusting agent, blowing agent, nuclear forming agent, antiforming agent, deformer, colourant, pigment, dyeing agent, carbon black, water tree preventing agent, voltage stabilizer, antitracking agent, organic peroxide, crosslinking agent, disinfectant, antiseptics, anti-mold agent and antirust agent.

In the present invention, the resin composition for purging contaminant means the resin composition which is fed from hopper to inside vacancy of the plastic processing machine to fill the vacacy with the resin composition.

The vacancy of plastic processing machine had been filled with other resin composition for producing the plastic mold or film and the surface of screw, barrel and die had been stuck with the coloured sticky contaminant formed by decomposition of the resin.

In case of long time operation or the resin composition changing for producing other sort of plastic article, remained resin composition used for previou product and the contaminat caused by

long time operation must be purged for new plastic article production to prevent closs-contamination.

The resin composition for purging contaminant and remained previously used resin composition is fed into plastic processing machine after previous plastic article production is over.

The resin composition for purging may be continuously fed or stopped after the resin composition is filled the vacancy of the plastic processing machine.

After the resin composition for purging is filled, then switch off the heat source and lower the machine temperature to room temperature and leaves the resin composition as it is for sufficient time such as from 6 to 48 hours to contact with contaminants and residue of previously used resin composition.

When the next plastic mold or film will be produced, the new resin composition for next plastic mold or film will be fed into the plastic processing machine, then the remained purge resin composition absobed with contaminant will be exhausted.

The resin used for the resin composition of present invention is the thermoplastic resin.

As the thermoplastic resin, there can be used high density polyethylene, high pressure low density polyethylene such as HP-LDPE, EVA, EEA, Ionomer, olefin vinylalcohol copolymer, LLDPE, VLDPE, polypropylene (PP), polystylene (PS),

acrylonitrile-butadiene-stylene copolymer (ABS), acrylonitrile-stylene copolymer (AS), acrylonitrile-butadiene copolymer, acrylonitrile acrylate-stylene copolymer, polyvinyl chloride (PVC), polyamide, polymethylmethacrylate (PMMA), polyacetal (POM), aminopolyacrylamide, polyarylate, fluoro carbon resin, polyimide (PI), polyamino-bismaleimide (PABI), polyamideimide (PAI), polyetherimide (PEI), bismaleimidetriazine resin (BT), polysulfone, polybutylene terephthalate (PBT), polyethylene terephthalate (PET), polyvinylidene chloride, polycarbonate (PC), polyvinyl acetate, polyvinyl alcohol, polyvinyl ether, polyvinyl formale, modified PPE, modified polyphenyleneoxide (PPO), polyphenylene sulfide (PPS), polyethersulfone (PESF), polyetheretherketone (PEEK), polyarysulfone (PAS), polymethylpenten (TPX), liquid crystal polymer, silicone resin, natural rubber (NR), butyl rubber (IIR), acrylonitrile-butadiene rubber (NBR), chloroprene rubber (CR), styrene butadiene rubber (SBR), butadiene rubber (BR).

Production method of the resin composition for purging away contaminant of the present invention is not limited to specific method, however following method is desirable.

To the 100 parts by weight of a themoplastic resin, 0.1~10 parts by weight of a borate ester of glycol ether expressed by general formula (1) is added.

The form of the thermoplastic resin may be powder or pellet form.

The borate ester of polyoxyalkylenes may be soaked into thermoplastic resin powder or pellet.

The soaking is desirable to conduct at the temperature of over the glass transition point because at the temperature soaking speed is fast.

The other production method for purge resin composition of the present invention may be conducted as follows.

The thermoplastic resin and borate ester of polyoxyalkylenes are fed to plastic processing machine or bunbury mixer, in which they are blended and extruded from pelletizing die having many hole of 3～7mm diameter.

Each extruded strings are cut to form pellet having the length of 3～7mm.

In case the amount of the borate ester of polyoxyalkylenes is less than 0.1 parts by weight, the resin composition for purging does not exhibit the cleaning and perging effect and in case more than 10 % parts by weight, it is not desirable because the uniform polymer blend is barely obtained.

EXAMPLE

Now, the resin composition for purging away contaminant in the plastic processing machine according to the present invention will be described in further detail with reference to Example.

However, it shoud be understood that

the present invention is by no means restricted by such specific Example.

Example 1

Borate ester of polyoxyalkylene expressed by chemical formula (2) was obtained by following synthesis process.

In a 7000 ml flask equipped with three inlet pipe and displaced by nitrogen gas were charged 146g (1 mole) of triethyl borate [$B(OC_2H_5)_3$], 1.2g of dibutyl tin dilaurate and 50 ml of benzene.

Subsequently, the solution in the flask was added with 996g (3 mole) of tripropyleneglycol triethylenglycol monomethyl ether under stirring condition to obtain uniform blended solution.

Subsequently, the solution in the flask was stirred for 13 hours at 95℃ under the condition of distillation to remove a ethanol and benzene as the byproduct to obtain 1002g (0.99 mole) of a borate ester of polyoxyalkylene expressed by chemical formula (2).

In a vessel, 99.0 parts by weight of high pressure low density polyethylene (made by Nippon Unicar Company Ltd., melt mass flow rate 1.2g/10 min., density 0.923 g/cm^3) and 1.0 parts by weight of borate ester of polyoxyalkylene expressed by chemical formula (2) obtained by above mentioned method were blended for 5 minutes under room temperature to obtain mixture, then the mixture was thrown into the continuous blending extruder (made

by K. C. K. Company Ltd., machine name K. C. K 80×2-35 VEX type) to produce the resin composition for purging away a contaminant as a pellet form having length of 3 mm and diameter of 3mm.

The resin composition was named thereafter purge resin composition (1).

Subsequently, the purging effect valuation test was conducted by following procedures.

Dry-blend was prepared by blending 95 kg of noncoloured low density polyethylene pellet (made by Toso Company Ltd., PETLOSENE 183) with 5kg of colour master batch (made by Tokyo Ink Company Ltd., PEX 3152, blue coloured), then the obtained dry-blend of 100kg were thrown to hopper of the extuder having 65mm diameter screw, then the dry-blend were fed into extruder to be heat-kneaded.

After 100kg of dry-blend were passed through the extruder, the purge resin composition (1) for purging away contaninant of the present invention obtained by above mentioned method were fed to the same extruder and passed through the said purge resin composition (1) till the residue of above mentioned colour master batch which were stuck or adhered to the surface of the screw and barrel were purged.

This procedure is called as decolourization.

As the blank test, decolourization test were conducted except that the resin composition for purging away con-

taminant of the present invention was exchanged to the non-coloured linear low density polyethylene pellet (made by Toso Company Ltd., FS240A).

Also, comparative parge resin composition I and comparative parge resin composition II were prepared for comparative decolourization test, which were equivalent to the conventional purge resin composition as described in above "Description of the Related Art".

Comparative parge resin composition I

Resin composition consisting 99.0 weight % of high pressure low density polyethylene (made by Nippon Unicar Company Ltd., melt massflow rate 1.2g/10 min., density 0.923g/cm^3) and 1.0 weight % of poly (9) oxyethylene nonylphenyl ether.

Comparative parge resin composition II

Resin composition consisting 99.0 weight % of high pressure low density polyethylene (made by Nippon Unicar Company Ltd., melt massflow rate 1.2g/10 min., density 0.923g/cm^3 and 1.0 weight % of poly (II) oxyethylene dodecylether sodium sulfate.

Result of decourrization of purge resin composition (1)

Each purge resin resin composition amount used till decolourization were obse-

rved were as follows.

- Purge resin composition (1) of the present invention ····· 22kg
- Blank test ····· 280kg
- Comparative parge resin composition I ····· 250kg
- Comparative parge resin composition II ····· 230kg

According to the above result, it was recognized that the purge resin composition (1) was excellent compared to the comparative purge resin composition, because the used amount of purge resin composition (1) was about 10% of the used amount of conventional type parge resin composition, resulting to achieve cost and time saving.

Example 2

Borate ester of polyoxyalkylenes expressed by chemical formula (8) was obtained by following synthesis process.

In a 7000 ml flask equipped with three inlet pipe and displaced by nitrogen gas were charged 146g (1 mole) of triethyl borate [$B(OC_2H_5)_3$], 1.2g of dibutyl tin dilaurate and 50ml of benzene.

Subsequently, the solution in the flask was added with 756g (3 mole) of pentylethyleneglycol monomethyl ether under stirring condition to obtain uniform blended solution.

Subsequently, the solution in the flask was stirred for 13 hours at 95℃ under the condition of distillation to

remove a ethanol and benzene as the by-product to obtain 758g (0.99 mole) of a borate ester of polyoxyalkylene expressed by chemical formula (8).

In a vessel, 99.0 parts by weight of high pressure low density polyethylene (made by Nippon Unicar Company Ltd., melt mass flow late 1.2g/10 min., density 0.923g/cm^3) and 1.0 parts by weight of borate ester of glycol ether expressed by chemical formula (8) obtained by above mentioned method and 1.0 parts by weight of polyoxyethylene (9) lauryl amine were blended for 5 minutes under room temperature to obtain mixture, then the mixture was thrown into the continuous-blending-extruder (made by K.C.K. Company Ltd., machine name K.C.K 80×2-35 VEX type) to produce the resin composition for purging away a contaminant as a pellet form having length of 3mm and diameter of 3mm. The resin composition was named thereafter purge resin composition (2).

Subsequently, the purging effect valuation test was conducted by following procedures.

Dry-blend was prepared by blending 95 kg of noncoloured low density polyethylene pellet (made by Toso Company Ltd., PETLOSENE 183) with 5kg of colour master batch (made by Tokyo Ink Company Ltd., PEX 3152, blue coloured), then the obtained dry-blend of 100kg were thrown to hopper of the extuder having 65mm diameter screw, then the dry-blend were fed into extruder to be heat-kneaded.

After 100kg of dry-blend were passed through the extruder, the purge resin composition (2) for purging away contaminant of the present invention obtained by above mentioned method were fed to the same extruder and passed through the said purge resin composition (2) till the residue of above mentioned colour master batch which were stuck or adhered to the surface of the screw and barrel were purged.

Result of decourrization of purge resin composition (2)

Each purge resin amount used till decolourization were observed were as follows.

- Purge resin composition (2) of the present invention ····· 20kg
- Blank test ····· 280kg
- Comparative parge resin composition I ····· 250kg
- Comparative parge resin composition II ····· 230kg

According to the above result, it was recognized that purge resin composition (2) of present invention was excellent compared to the other purge resin, because the used amount of purge resin composition of the present invention was about 10% of the used amount of conventional parge resin composition, resulting to achieve cost and time saving.